

REMARKS

At the outset, Applicants would like to thank Examiner Boutsikaris for the courtesy shown during the personal interview that was conducted on January 10, 2006. In addition to Dr. Boutsikaris, the interview was attended by two of the inventors in the subject application, Omur Sezerman and Kenneth Hill, their Canadian representative, Wayne Rock, and the undersigned attorney, William A. Blake. During the interview, Mr. Sezerman demonstrated embodiments of the subject invention and other related inventions. At the conclusion of the interview, it was tentatively agreed that certain features of the invention were not disclosed or suggested by the prior art but that these features would have to be more clearly recited in the claims. The claims have now been further amended in response to the discussions during the interview. As discussed below, Applicants respectfully submit that the changes to the claims patentably distinguish the claims over the prior art references of record.

With reference to the prior art rejections, claims 1-4, 6, 8, 9, 11-16, 18, 20-28, 30, 32-36, 53 and 54 stand rejected under 35 U.S.C. 103(a) as being unpatentable over US 2001/0021293 to Kouta in view of US 2002/0085824 to Dugan and the SPIE article by Cho. The remaining claims stand rejected under 35 U.S.C. 103 as being unpatentable over these 3 references in view of either US 2003/0099452 to Borelli or US 2002/0162360 to Schaffer. Applicants respectfully submit that all of these rejections are traversed in view of the claim amendments and the foregoing reasons.

It should first be noted that the claimed method should not be seen as operating on an existing waveguide device to modify such a device, but as actually creating a new waveguiding device. At first, this may seem to be a subtle distinction but it is actually quite significant. All of the references relied upon in the rejections, and in particular the primary citation of Kouta, teach

the modification of an existing waveguide, illustrated in Kouta as including a plurality of fiber cores 56 within a slab-like cladding material 11. The waveguide already exists and is modified by the movement of the laser beam focal region along the length of the core. The present invention, on the other hand, starts with a standard elongated optical fiber, typically having a cylindrical core within an annular cladding, and creates a zone of altered refractive index characteristics of the optical fiber to thereby create a new waveguiding device, determined by the type of modifications effected to the fiber. The method of the present invention can result in new optical fiber taps, polarizers, etc. which are much easier to manufacture than in the past and which will be considerably less expensive than those that might be provided by Kouta or the other references of record.

Independent claims 1, 13 and 25 have been amended to recite that the defined target region extends through the core and at least partially through the cladding of the optical fiber, at an acute angle to a longitudinal axis thereof; relative movement is provided between the optical fiber and the laser beam such that the laser beam focal region sweeps along said target region; and the thus formed optical waveguiding device exhibits controlled polarization sensitivity.

As was discussed during the interview, the writing of the zone of altered refractive index along a target region or path which extends through at least the core and at least partially through the cladding, with the swept path being at an acute angle to the longitudinal axis of the core, is neither disclosed or suggested by the references of record. As was noted, Kouta and Dugan both appear to sweep the beam in a manner such that the swept path is parallel to the longitudinal axis, in fact a path which is co-extensive with the core. Neither of these teachings would lead to a product which finds practical application as a tap, attenuator, polarimeter, etc. as does the method of the present invention. As aptly demonstrated by Mr. Sezerman at the interview, the

method of this invention does, indeed, result in a product having practical application in the real world. The method of the present invention does work. It can be automated and can lead to very economical products that will have extensive use in the fiber optic market, especially in power meters and other systems requiring knowledge of the performance of an optical fiber network.

Another notable feature of the invention which has been added to claim 1, 13 and 25 and is neither disclosed in nor suggested by the references of record is that the method results in a structure that demonstrates controlled polarization sensitivity during use. Generally speaking, by controlling the passage of the laser beam focal region through the optical fiber it is possible to achieve a waveguiding device that is generally polarization insensitive or, if desired, can exhibit particular degrees of polarization sensitivity.

The other important aspect of the present invention which was demonstrated and emphasized to the examiner is the fact that the present invention operates on an optical fiber having a core and a cladding, in essence a standard commercially available off the shelf optical fiber. The method of the invention operates on such a fiber to create a new waveguiding device. Contrary to the teachings of Kouta, in particular, the method of the present invention does not operate on an existing waveguide, such as the slab type of waveguide illustrated in Kouta. The method of the present invention involves the writing (and creation) of new waveguides within an optical fiber.

Dugan does not teach the creation of a new waveguide within an optical fiber. Dugan is teaching the writing of a longitudinally extending profile within the core of a generally rectangular waveguide so as to effect index trimming. He does not teach the creation of a new waveguide from an optical fiber by sweeping a focal region of a laser beam along a path at an acute angle to the longitudinal axis of the fiber. As emphasized by Mr. Sezerman at the interview

the Dugan method would not result in a practical, commercial product, and it is even questionable whether his method is operable. On the other hand, it is clear from the demonstration that the present invention is operable and commercially valuable.

Regarding the reference to Cho, while it is true that Cho appears to work with an optical fiber it cannot be said that Cho teaches anything that is particularly relevant to the present invention. Cho is focusing the beam of a laser into the end face of a fiber so as to improve the coupling capability of the fiber. There is no suggestion in Cho of the creation of new waveguiding devices through the writing of zones of altered refractive index as set forth in revised claim 1, even taking the teachings of Cho in combination with those of Kouta and Dugan.

In summary it is important to note that the present invention is not concerned with altering the refractive index of existing waveguides, as do Kouta and Dugan. On the other hand the present invention involves the creation of new waveguides out of standard, commercially available optical fibers. This fact is clear from the preamble to claim 1, for example, and was discussed in the previous Amendment. Furthermore, the method of the present invention involves the sweeping of the focal region of the femtosecond laser along a target path that not only extends at least through the core and at least partially through the cladding, but is also acutely angled with respect to the longitudinal axis of the fiber. In both Kouta and Dugan the writing of a zone of altered refractive index is along the core's axis. Neither Kouta nor Dugan is creating a new waveguide that can be commercially used as an inexpensive tap, power meter, polarimeter, attenuator, etc. For the foregoing reasons, Applicants respectfully submit that claims 1, 13 and 25 as amended are patentable and allowable over the references of record. For the same

reasons, the dependent claims, which bring in specific features relating to the claimed method, are also believed to be patentable over the references of record.

In view of the foregoing, Applicants respectfully submit that all of the claims are now allowable over the prior art of record and that the application is now in condition for allowance. Accordingly, favorable reconsideration of the application is respectfully requested.

Respectfully submitted,

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